REMARKS

This application has been carefully reviewed in light of the final Office Action dated September 21, 2006. Claims 18, 21, 24, 27, and 29 to 33 have been cancelled herein, without prejudice or disclaimer of subject matter. Claims 17, 20, 23, and 26 have been amended, and Claims 34 to 52 have been added. Claims 17, 20, 23, 26, 34, 45, 48, and 50 to 52 are the independent claims. Reconsideration and further examination are respectfully requested.

Initially, Applicant submits that, because support for the substance of the new claims is found throughout the disclosure including at least pages 21 to 22 and Figures 1 to 11, no new matter has been added.

Furthermore, Applicant acknowledges with appreciation the Examiner's indication that claims 18, 21, 24, and 27 would be allowable if rewritten in independent form. In accordance with the Examiner's suggestion, Applicant has incorporated the substance of claim 18 into independent claim 17, has incorporated the substance of claims 17 and 21 into independent claim 20, has incorporated the substance of claims 17 and 24 into independent claim 23, and has incorporated the substance of claim 27 into independent claim 26. Applicant further notes that independent claims 17, 20, 23 and 26 have also been amended for editorial reasons. Accordingly, reconsideration and withdrawal of the remaining rejections, as moot, are respectfully requested.

Claim 17, which was objected to for an alleged informality, has been amended to further clarify that the input signal is input into the first input terminal. Furthermore, the title has also been amended to further clarify that noise removal occurs using a 180-degree or 360-degree phase-shifting circuit. Applicant thus respectfully requests reconsideration and withdrawal of the objections, as moot.

Claims 17, 20, 23, and 31 were rejected under 35 U.S.C. § 102(b) over U.S. Patent No. 5,934,115 ("Lampel"); claims 19, 22, 25, 26, 28, and 32 were rejected under 35 U.S.C. § 103(a) over Lampel in view of 6,081,490 ("Kuroda"); and claims 29, 30, and 33 were rejected under 35 U.S.C. § 103(a) over Lampel in view of Kuroda, and further in view of U.S. Patent No. 6,104,682 ("Konishi"). As indicated above, claims 18, 21, 24, 27, and 29 to 33 have been

cancelled herein, without prejudice or disclaimer of subject matter, and without conceding the correctness of the associated rejections, which are therefore considered to be moot. Reconsideration and withdrawal of the rejection are respectfully requested.

According to one general implementation, the present disclosure relates to the removal of noise. At an input terminal, an electrical input signal is received from an external source, and, at a phase-shifting circuit further including a phase-shift input terminal electrically connected to the input terminal, and a phase-shift output terminal, the electrical input signal is received. Furthermore, at the phase shifting circuit, the phase of the electrical input signal is shifted by an odd multiple of 180-degrees to produce a phase-shifted signal, and the phase-shifted signal is output via the phase-shift output terminal. Additionally, at an operational amplifier, the phase-shifted signal is received, the operational amplifier further including a first terminal electrically connected to the input terminal, a second terminal having an opposite polarity than the first terminal, the second terminal electrically connected to the phase-shift output terminal, and an output terminal. A difference signal corresponding to a difference between the electrical input signal and the phase-shifted signal is output from the operational amplifier.

Referring to particular claim language, claim 34 recites a noise removal apparatus including an input terminal configured to receive an electrical input signal from an external source. The noise removal apparatus also includes a phase-shifting circuit further including a phase-shift input terminal electrically connected to the input terminal, and a phase-shift output terminal. The phase-shifting circuit is configured to shift the phase of the electrical input signal by an odd multiple of 180-degrees to produce a phase-shifted signal and output the phase-shifted signal via the phase-shift output terminal. The noise removal apparatus further includes a first operational amplifier further including a first terminal electrically connected to the input terminal. The operational amplifier also includes a second terminal having an opposite polarity than the first terminal, the second terminal electrically connected to the phase-shift output terminal, the first operational amplifier configured to output a difference signal corresponding to a difference between the electrical input signal and the phase-shifted signal.

Claim 50 recites a method substantially corresponding to apparatus claim 34.

The applied art is not seen to disclose, teach, or to suggest the foregoing features recited by independent claims 34 and 50. In particular, Lampel is not seen to disclose at least the

features that *i)* at an input terminal, an electrical input signal is received from an external source, *ii)* the 180-degree shifted electrical input signal is input to a second input terminal of the operational amplifier, the first and second input terminals having opposite polarities, and *iii)* a difference signal corresponding to the difference between the input signal and the 180-degree shifted electrical input signal is output from an output terminal of the operational amplifier.

Lampel is seen to disclose an automatic sweep acquisition circuit for phase-locked-loops ("PLLs") that includes an operational amplifier 101, an input impedance 103, a feedback impedance 104, and a sweep circuit 109. *See* Lampel, col. 3, ll. 3 to 13 and 40 to 54; and Abstract. The sweep circuit 109 is seen to provide a non-inverting input 130 with a positive feedback signal that is substantially 180 degrees out-of-phase with inverting input 125 of the operational amplifier 101. *See* Lampel, col. 4, ll. 54 to 66.

In contrast to Lampel, the present disclosure provides that a phase-shifting circuit further including a first terminal is electrically connected to an input terminal, and a second terminal. The input terminal is configured to receive an electrical input signal from an external source. Thus, the phase-shifted signal is based upon the electrical input signal, not upon feedback from an output terminal of an operational amplifier. The positive feedback signal described by Lampel is a signal which is seen to be fed back to the inverting input 130 of the operational amplifier 101 from a node 105 of the operational amplifier 101 via the sweep circuit 109, the signal is seen to be based upon feedback from the operational amplifier 101. *See* Lampel, Figure 1.

Accordingly, the sweep circuit 109 of Lampel is seen to be interposed in a feedback loop of the operational amplifier 101. As such, Lampel is not seen to disclose, nor does the Office Action even assert that Lampel discloses, at least the features that *i)* at an input terminal, an electrical input signal is received from an external source, *ii)* the 180-degree shifted electrical input signal is input to a second input terminal of the operational amplifier, the first and second input terminals having opposite polarities, and *iii)* a difference signal corresponding to the difference between the input signal and the 180-degree shifted electrical input signal is output from an output terminal of the operational amplifier.

According to another general implementation, the present disclosure relates to the removal of noise. At an input terminal, an electrical input signal is received from an external

source and, at a phase-shifting circuit, the phase of the electrical input signal is shifted by a multiple of 360-degrees to produce a phase-shifted signal, where the phase-shifted signal is output via the phase-shift output terminal. At an operational amplifier, the phase-shifted signal is received, the operational amplifier further including a first non-inverting terminal electrically connected to the input terminal, a second non-inverting terminal electrically connected to the phase-shift output terminal, and an output terminal. A summation signal corresponding to a summation of the electrical input signal and the phase-shifted signal is output via the output terminal of the operational amplifier.

Referring to particular claim language, independent claim 45 recites a noise removal apparatus including an input terminal configured to receive an electrical input signal from an external source. The apparatus further includes a phase-shifting circuit further including a first terminal electrically connected to the input terminal, and a second terminal. The phase-shifting circuit is configured to shift the phase of the electrical input signal by a multiple of 360-degrees to produce a phase-shifted signal, and output the phase-shifted signal via a second terminal. The noise removal apparatus further includes a first operational amplifier further including a first non-inverting terminal electrically connected to the input terminal, and a second non-inverting terminal electrically connected to the second terminal, the first operational amplifier configured to output a summation signal corresponding to a summation of the electrical input signal and the phase-shifted signal.

Independent claim 51 recites a method claim substantially corresponding to apparatus claim 45.

The applied art is not seen to disclose, teach, or to suggest the foregoing features recited by independent claims 45 and 51. In particular, and for the reasons described above with respect to claims 34 and 50, Lampel is also not seen to disclose, nor does the Office Action even assert that Lampel discloses, at least the features that *iv)* an input terminal configured to receive an electrical input signal from an external source, that *v)* the electrical input signal is input to a first input non-inverting terminal of an operational amplifier, *vi)* the 360-degree shifted signal is input to a second non-inverting terminal of the operational amplifier, and *vi)* a summation signal corresponding to a summation of the electrical input signal and the 360-degree shifted signal is output from an output terminal of the operational amplifier.

According to another general implementation, the present disclosure generally relates to noise removal, in which, at an input terminal, an electrical input signal is received from an external source. At a first phase-shifting circuit, the electrical input signal is received circuit, the first phase-shifting circuit further including a first phase-shift input terminal electrically connected to the input terminal, and a first phase-shift output terminal and, at a second phase-shifting circuit, the electrical input signal is received, the second phase-shifting circuit further including a second phase-shift input terminal electrically connected to the input terminal, and a second phase-shift output terminal. At the first phase-shifting circuit, the phase of the electrical input signal is shifted by an odd multiple of 180-degrees to produce a first phase-shifted signal and, at the second phase-shifting circuit, the phase of the electrical input signal is shifted by a multiple of 360-degrees to produce a second phase-shifted signal. The first phase-shifted signal is output via the first phase-shift output terminal, and the second phase-shifted signal is output via the second phase-shift output terminal. At an inverting terminal of an operational amplifier, the first phase-shifted signal is received, and, at a first non-inverting terminal of the operational amplifier, the second phase-shifted signal is received. At a second non-inverting terminal of the operational amplifier, the electrical input signal is received. An output signal corresponding to a summation of the electrical input signal and the second phase-shifted signal minus the first phase-shifted signal is produced.

Referring to particular claim language, independent claim 48 recites a noise removal apparatus that includes an input terminal configured to receive an electrical input signal from an external source. The noise removal apparatus also includes a first phase-shifting circuit further including a first phase-shift input terminal electrically connected to the input terminal, and a first phase-shift output terminal. The first phase-shifting circuit is configured to shift the phase of the electrical input signal by an odd multiple of 180-degrees to produce a first phase-shifted signal, and output the first phase-shifted signal via the first phase-shift output terminal. The noise removal apparatus also includes a second phase-shifting circuit further including a second phase-shift input terminal electrically connected to the input terminal, and a second phase-shift output terminal. The second phase-shifting circuit is configured to shift the phase of the electrical input signal by a multiple of 360-degrees to produce a second phase-shifted signal, and output the second phase-shifted signal via a second phase-shift output terminal. The noise removal

apparatus further includes an operational amplifier further including an inverting terminal electrically connected to the first phase-shift output terminal, a first non-inverting terminal electrically connected to the second phase-shift output terminal, and a second non-inverting terminal electrically connected to the input terminal, the operational amplifier configured to output an output signal corresponding to a summation of the electrical input signal and the second phase-shifted signal minus the first phase-shifted signal.

Independent claim 52 recites a method substantially corresponding to method claim 48.

The applied art is not seen to disclose, teach, or to suggest the foregoing features recited by independent claims 48 and 52. In particular, and for the reasons stated above with respect to independent claims 34 and 50, Lampel is not seen to disclose, nor does the Office Action even assert that Lampel discloses, at least the features that *viii)* an input terminal configured to receive an electrical input signal from an external source, *xi)* the electrical input signal is input to a first non-inverting terminal of an operational amplifier, and the 360-degree shifted signal is input to a second non-inverting input terminal of the operational amplifier, *xii)* the 180-degree shifted signal is input in an inverting terminal of the operational amplifier, and *ix)* an output signal corresponding to a difference of a sum of the electrical input signal and the 360-degree shifted signal from the 180-degree shifted signal is output from the operational amplifier.

As such, Lampel is not seen to disclose at least the features of *i)* an input terminal configured to receive an electrical input signal from an external source, *ii)* the 180-degree shifted electrical input signal is input to a second input terminal of the operational amplifier, the first and second input terminals having opposite polarities, *iii)* a difference signal corresponding to the difference between the input signal and the 180-degree shifted electrical input signal is output from an output terminal of the operational amplifier, *iv)* an input terminal configured to receive an electrical input signal from an external source, *v)* the electrical input signal is input to a first input terminal of an operational amplifier, *vi)* the 360-degree shifted signal is input to a second input terminal of the operational amplifier, the first and second input terminals having a same polarity, and *vi)* a summation signal corresponding to a summation of the electrical input signal and the 360-degree shifted signal is output from an output terminal of the operational amplifier.

Accordingly, based on the foregoing remarks, independent claims 17, 26, 29, and 31 to 33 are believed to be allowable over the applied references. The other remaining claims in the

application are either indicated as containing allowable subject matter, or are each dependent on these independent claims and are believed to be allowable for at least the same reasons. Because each dependent claim is deemed to define an additional aspect of the invention, individual consideration of each on its own merits is respectfully requested.

No other matters being raised, it is believed that the entire application is fully in condition for allowance and such action is courteously solicited.

Fees in the amount of $800.00 for the excess claims are being paid concurrently herewith on the Electronic Filing System (EFS) by way of Deposit Account authorization. Please apply any other charges or credits to deposit account 06-1050.

Respectfully submitted,

Date: November 21, 2006

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